(12) **UK Patent Application** (19) **GB** (11) **2 309 619** (13) **A**

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(54) Protocol coverter card for ATM/Token ring

(57)   A communication network end station comprises a host processor (6) programmed to cooperate with interface electronics suitable for transferring data between the host processor and a communication network (5) operating in accordance with a first protocol. An interface device (7) connects the end station to a communication network on which data is carried in accordance with a second protocol. The interface device includes:
a) a first interface (9) which cooperates with the programmed host processor (6) to transfer data to and from the host processor in accordance with the requirements of the first protocol;
b) a second interface (13) which transfers data to and from the communication network (5) in accordance with the requirements of the second protocol; and,
c) a conversion system (10-12) for transferring data between the first and second interfaces and for suitably converting the format of the data passing therebetween.
The protocols can be ATM and token ring.

Fig.2.

TR BUFFERS 9

PROC. 10

ATM BUFFERS 11

ATM PROTOCOL HANDLER 12

ATM FRONT END 13

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Fig.1.

Fig.2.

Fig.3.

HEADER 20

INFORMATION FIELD 21

5 BYTES

48 BYTES

1 2 3 4 5

	1	2	3	4	5	6	7	8
1	GFC				VPI			
2	VPI				VCI			
3			VCI					
4				VCI	PT			CLP
5				HEC				

22

27

UNI 25

26

VPI

VPI

VCI

PT CLP

23

24

VPI

VCI

PT CLP

NNI

Fig.4.

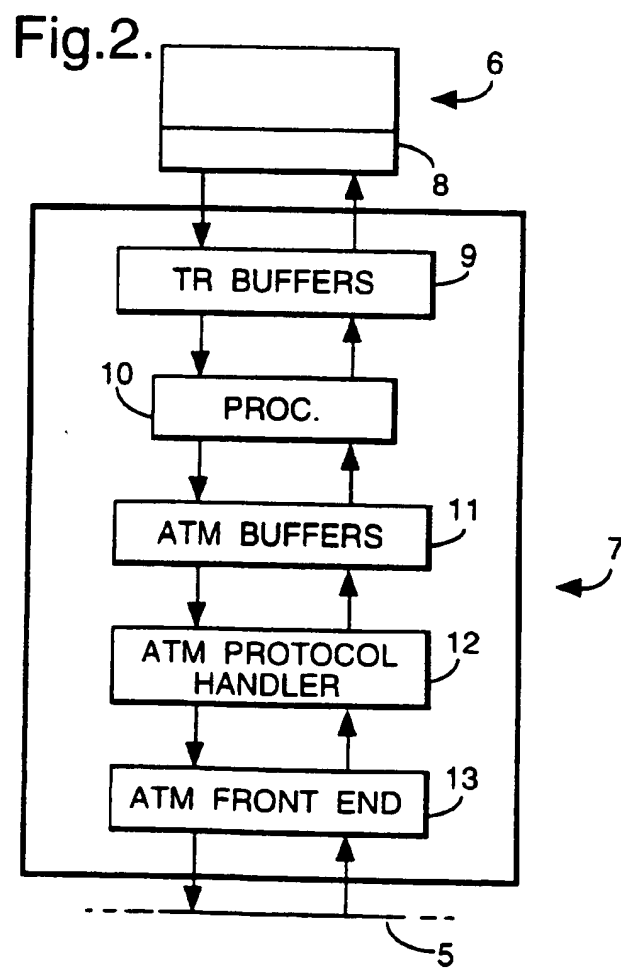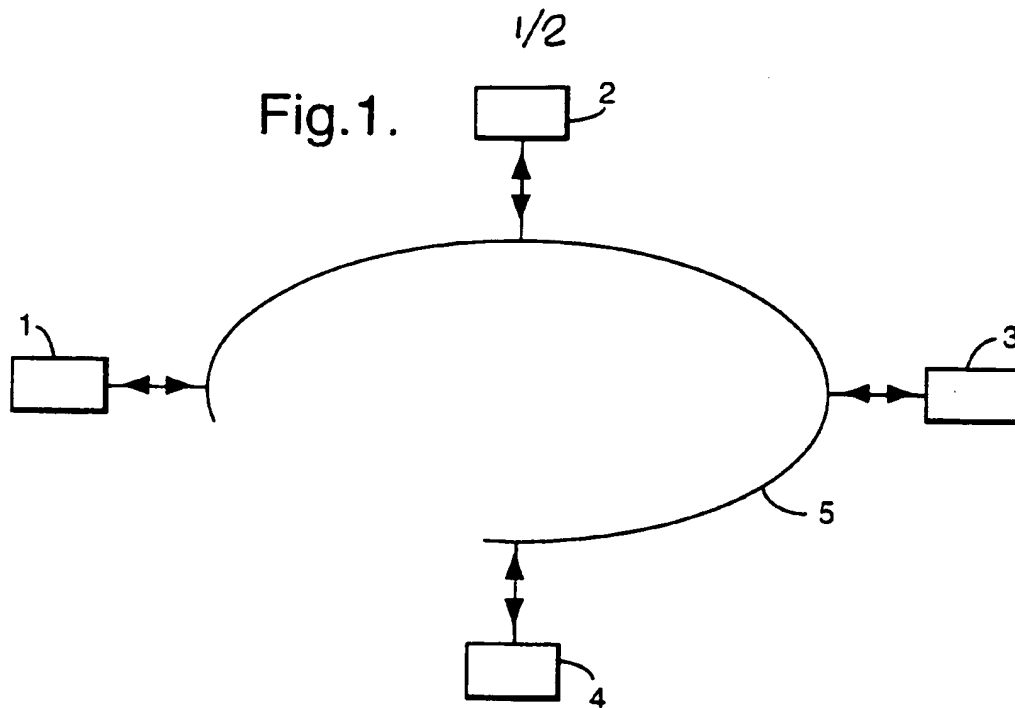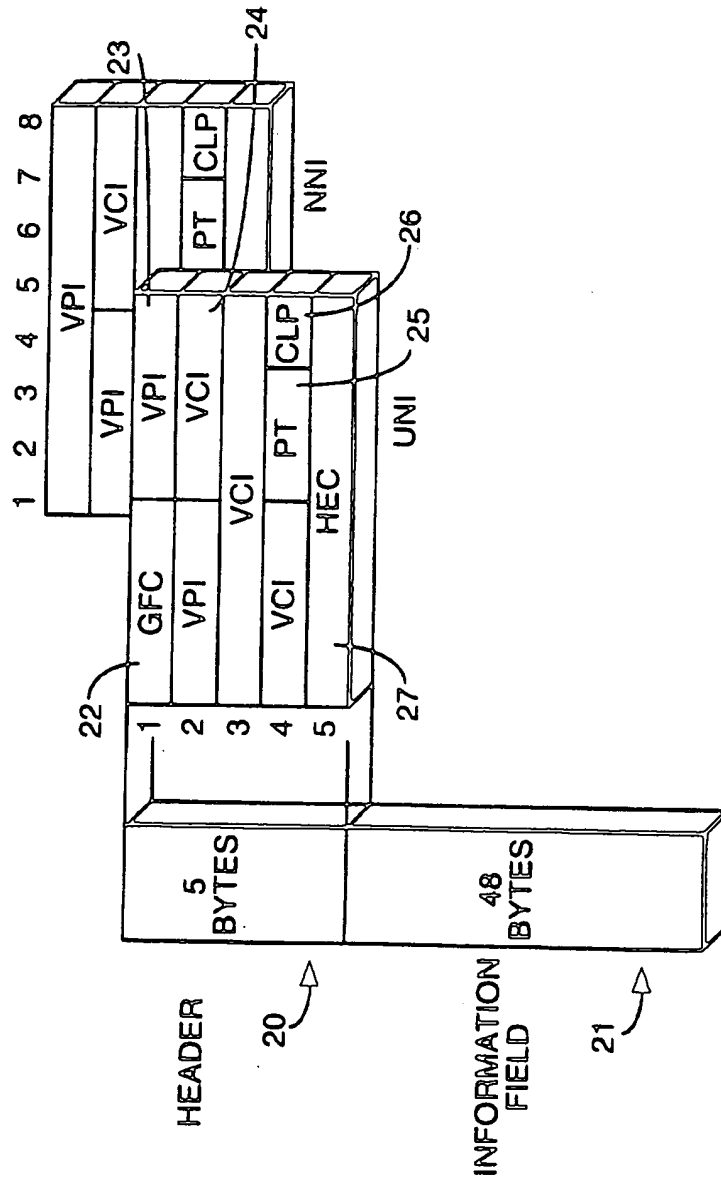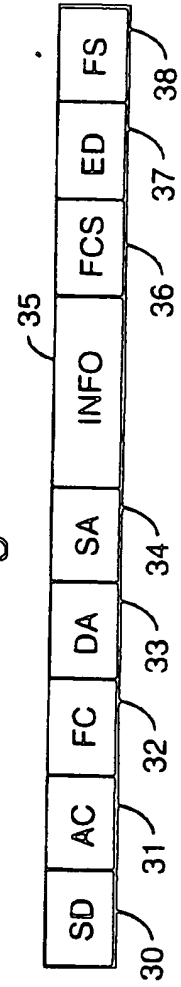| SD	AC	FC	DA	SA	INFO	FCS	ED	FS
30	31	32	33	34	35	36	37	38

COMMUNICATION NETWORK END STATION
AND ADAPTOR CARD

The invention relates to a communication network end
station for use with a communication network and also to an
adaptor card for insertion into such a communication
network end station.

Data communication networks are provided to enable the
transfer of data between end stations such as personal
computers, file servers and other communication networks.
Data is transmitted around such networks in accordance with
standard protocols such as token ring, ethernet, FDDI or
ATM. Conventionally, an end station will interface to the
network through a connecting device, typically an adaptor
card, installed in the end station. The end station will
include a host processor programmed to cooperate with
interface electronics on the adaptor card so as to provide
data for the network in a format compatible with the
network protocol and it will also convert data received
from the network into a format compatible with the end
station. The connecting device controls the flow of data
from the end station onto the network and from the network
on to the end station.

A problem arises if the end station is to be connected
to another network operating a different protocol. In that
situation, not only is it necessary to change the
connecting device or adaptor card, but it is also necessary
to reprogramme the host processor.

In accordance with one aspect of the present
invention, a communication network end station comprises a
host processor programmed to cooperate with interface
electronics suitable for transferring data between the host
processor and a communication network operating in
accordance with a first protocol; and an interface device
for connecting the end station to a communication network
on which data is carried in accordance with a second
protocol, the interface device including:

a) first interface means which cooperates with the programmed host processor to transfer data to and from the host processor in accordance with the requirements of the first protocol;

5   b) second interface means which transfers data to and from the communication network in accordance with the requirements of the second protocol; and,

c) conversion means for transferring data between the first and second interface means and for suitably

10   converting the format of the data passing therebetween.

In accordance with a second aspect of the present invention, an adaptor card for insertion into a communication network end station which includes a host processor programmed to cooperate with interface

15   electronics suitable for transferring data between the host processor and a communication network operating in accordance with a first protocol, the adaptor card comprising an interface device for connecting the end station to a communication network on which data is carried

20   in accordance with a second protocol, the interface device including:

a) first interface means which cooperates with the programmed host processor to transfer data to and from the host processor in accordance with the requirements of the

25   first protocol;

b) second interface means which transfers data to and from the communication network in accordance with the requirements of the second protocol; and,

c) conversion means for transferring data between

30   the first and second interface means and for suitably converting the format of the data passing therebetween.

We have designed a new interface device which avoids the need to reprogramme the host processor even if there is a change in communication network protocol. The interface

35   device simply needs to be replaced which, when it is fabricated as an adaptor card, is a very straightforward operation. The interface device presents to the host

processor the appearance of a communication network operating in accordance with the first protocol while it presents to the communication network the appearance of an end station operating in accordance with the second protocol.

It should be understood that although the first and second interface means and conversion means have been specified as identifiable, separate components, in practice they are likely to be intermixed. Typically the interface device includes processing means to provide part or all of one or more of the first interface means, the second interface means, and the conversion means.

The conversion means will be designed to handle a particular protocol conversion, for example token ring/ATM, and will identify the relevant parts of a token ring frame needed to set up an ATM cell and vice versa. The first interface means will provide the necessary acknowledgements expected by the host processor on transmitting data to the interface device while the second interface means will provide the expected acknowledgements to the communication network.

An example of a communication network end station and adaptor card according to the invention will now be described with reference to the accompanying drawings, in which:-

Figure 1 is a schematic view of a communication network;

Figure 2 is a block diagram of one of the end stations incorporating an interface device shown in Figure 1;

Figure 3 illustrates a typical ATM cell structure; and,

Figure 4 illustrates a typical token ring frame structure.

The communication network shown in Figure 1 comprises four end stations 1-4 connected together by a communication medium 5. The end stations 1-4 could include a personal computer, a file server or another communication network.

In this example, data is transmitted between the end stations 1-4 in accordance with an ATM protocol.

Figure 2 illustrates the construction of one of the end stations of Figure 1 in more detail. The end station comprises a host processor 6 to which is connected an adaptor card 7 which interfaces with the communication medium 5. The host processor 6 includes a computer programme 8 suitable for handling data transfer with the adaptor card in accordance with a token ring protocol such as that defined by the international standard IEEE802.5. The adaptor card includes a set of token ring buffers 9, a processor 10, a set of ATM buffers 11, an ATM protocol handler 12, and an ATM front end circuit 13. The buffers 9,11 could be provided on the same memory chip.

The function of the adaptor card 7 is to present to the host processor 6 the appearance of a token ring interface while presenting to the communication network 5 an ATM interface.

Figure 3 illustrates the format of a typical ATM cell. The cell is 53 bytes long and contains two main fields: a header field 20 of 5 bytes and an information field or data field 21 of 48 bytes.

The header field 20 includes a flow control field (GFC) 22. Three bytes are provided for the logical identifier VPI,VCI 23,24. Three bits are provided for Payload Type Identification (PTI) 25 and one bit 26 for Cell Loss Priority (CLP). Finally, one Header Error Control byte 27 is provided for detecting errors and for correcting simple errors involving the header.

A typical token ring frame format is shown in Figure 4. The frame commences with a starting delimiter 30, an access control byte 31 and a frame control byte 32. A destination address is stored at 33 and a source address at 34. This is followed by information 35 carried by the frame. The frame terminates with a frame check sequence 36, an ending delimiter 37, and a frame status byte 38.

In use, when the host processor 6 has data to transmit, it constructs a token ring frame in accordance with the programme 8 and this frame is transferred in a conventional manner to the adaptor card 7 and in particular the token ring buffers 9. The processor 10 responds to the arrival of such a frame by transmitting an acknowledgement signal back to the host processor 6 which assumes that the token ring frame has been accepted for transmission.

The processor 10 extracts and reads the data frame header 30-34 from the token ring frame supplied to the buffers 9. The destination address 33 contained in the header is mapped to an associated VPI and VCI and the processor creates an ATM cell structure which contains the VPI and VCI information. Up to 48 bytes of a token ring frame structure, stored in the buffers 9 is placed into the ATM cell structure by the processor 10. The processor 10 also prepends other control data onto the front of the ATM cell to allow the interface device output means to control the flow of the ATM cell structures to the output interface. The ATM cell structure is then stored in the buffers 11. A transmit buffer manager within the protocol handler 12 then extracts the ATM cell structure at the appropriate time and passes the cell structure to the transmit circuitry or front end 13 to be passed onto the network. This process continues until the whole token ring frame supplied from the host processor has been output on to the ATM network.

On receipt of an ATM cell from the communication network 5, the front end 13 informs a receive buffer manager within the protocol handler 12 that an ATM cell has arrived. The processor 10 informs the receive buffer manager of the first free location in the buffers 11. The receive buffer manager then creates ATM structure buffer locations for the received ATM cell. The processor 10 then creates a token ring frame structure in the buffers 9. To do this, the processor extracts the ATM cell data and places the data into the relevant token ring frame. When

all the ATM data for a specific token ring frame has been placed in the token ring frame the adaptor device informs the end station that it has data ready to send to it. The host processor 6 responds to the storing of a frame in the 5 buffers 9 as if the frame had arrived on a token ring protocol network.

More details on the manner in which a token ring frame is stored can be found in the IBM standard "Token Ring Network Adapter Interface" Version 1 Release 1.0 Ref: SC30- 10 3588-00. The process of cell segmentation and reassembly to emulate a token ring network follows the ATM Forum standard "LAN Emulation Over ATM Version 1.0" Ref: af-lane- 0021.000. The acknowledgements which are provided to the host are also in accordance with the IBM standard "Token 15 Ring Network Adapter Interface".

CLAIMS

1. A communication network end station comprising a host processor programmed to cooperate with interface electronics suitable for transferring data between the host processor and a communication network operating in accordance with a first protocol; and an interface device for connecting the end station to a communication network on which data is carried in accordance with a second protocol, the interface device including:

   a) first interface means which cooperates with the programmed host processor to transfer data to and from the host processor in accordance with the requirements of the first protocol;

   b) second interface means which transfers data to and from the communication network in accordance with the requirements of the second protocol; and,

   c) conversion means for transferring data between the first and second interface means and for suitably converting the format of the data passing therebetween.

2. An end station according to claim 1, wherein the interface device includes processing means to provide part or all of one or more of the first interface means, the second interface means, and the conversion means.

3. An end station according to claim 1 or claim 2, further comprising a memory into which data can be stored in accordance with the first and second protocols.

4. An end station according to any of the preceding claims, wherein the first protocol comprises a token ring protocol.

5. An end station according to any of the preceding claims, wherein the second protocol comprises an ATM protocol.

6. A communication network end station substantially as hereinbefore described with reference to the accompanying drawings.

7. A communication network which connects together a number of end stations, at least one of the end stations being in accordance with any of claims 1 to 6, the communication network carrying data in accordance with the second protocol.

8. An adaptor card for insertion into a communication network end station which includes a host processor programmed to cooperate with interface electronics suitable for transferring data between the host processor and a communication network operating in accordance with a first protocol, the adaptor card comprising an interface device for connecting the end station to a communication network on which data is carried in accordance with a second protocol, the interface device including:

    a) first interface means which cooperates with the programmed host processor to transfer data to and from the host processor in accordance with the requirements of the first protocol;

    b) second interface means which transfers data to and from the communication network in accordance with the requirements of the second protocol; and,

    c) conversion means for transferring data between the first and second interface means and for suitably converting the format of the data passing therebetween.

9. An adaptor card according to claim 8, wherein the interface device includes processing means to provide part or all of one or more of the first interface means, the second interface means, and the conversion means.

10. An adaptor card according to claim 8 or claim 9, further comprising a memory into which data can be stored in accordance with the first and second protocols.

11. An adaptor card according to any of claims 8 to 10, wherein the first protocol is a token ring protocol.

12. An adaptor card according to any of claims 8 to 11, wherein the second protocol is an ATM protocol.

13. An adaptor card substantially as hereinbefore described with reference to the accompanying drawings.

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Claims searched: 1-13   Date of search: 20 February 1997

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:
UK Cl (Ed.O): H4P (PPEC)
Int Cl (Ed.6): H04L 29/06
Other: Online: WPI, INSPEC

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
X	EP0648034A1	(Bell) Whole document, eg p 3 ll 9-42, claim 15 and Fig. 1	1-5,7 at least
XE	WO96/35988A1	(3COM) Whole document, eg p 1 ll 8-13, p 3 l 3 to p 5 l 3 and pp 71-73.	1-5,7-12
X	JP6303250A	(Roke Manor Research) Whole document, see eg WPI abstract.	1,4,5 at least
X	Data Communications, Computer Networks and Open Systems by Fred Halsall pages 432-33 3rd Ed pub. 1992 by Addison Wesley ISBN 0-201-56506-4		1-3,7 at least
X	ATM Networks by R.Handel, M,N,Huber and S. Schroder pages 49-53 2nd. Ed. pub. 1994 Addison-Wesley ISBN 0-201-42274-3		1-5,7 at least